

TRIBAL REVISIONS IN THE ASTERACEAE. II.

THE RELATIONSHIP OF TRICHOSPIRA.

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The genus Trichospira has been placed in various sections of the Asteraceae during the years since it was described. Kunth (1818) originally described the genus and included it with Lagascea, Elephantopus, Rolandra and Spiracantha in a section Carduaceae subsection Echinopsidae. The subsection immediately preceded Kunth's subsection Vernoniaceae. Cassini (1819) extensively reviewed the work of Kunth placing most of the Echinopsidae including Trichospira in the new tribe Vernonieae while placing Lagascea in the Heliantheae. Cassini emphasized the structure of the style as a basis for his tribe. Bentham (1873) seemed to think the genus had more Helianthian characters than Vernonian and he transferred the species listing it near Synedrella. Hoffman (1894) followed the system of Bentham placing the genus in the Coreopsinae, but he also mentioned Trichospira in the key to the Vernonieae. Though it was not stated, the assignment of Trichospira to the Heliantheae and especially to the Coreopsinae seems to be based on the strongly bicornute form of the achene. All recent treatments have followed Hoffman.

A recent survey of the microscopic features of the genera of the Helianthieae has caused the authors to reconsider the position of Trichospira. A broad spectrum of structures has been studied with some difficulties encountered because of the very reduced size of the flowers and particularly the anthers. Trichospira is found to be clearly a member of the Vernonieae in spite of the exceptional achene and the genus does not conform to the natural limits we recognize for the Coreopsinae.

The case for the Vernonieae includes the structures of the following parts:

Leaves: The alternate insertion of the leaves is particularly marked in the two tribes Vernonieae and Inuleae. Such alternate leaves are also a marked feature of Trichospira. The unusual feature of the latter genus is the seemingly opposite position of the leaves in the inflorescence of the plant, an unusual type of modification, at best, since the reverse type of change is the only one noted in most composites. Close examination shows that the leaves of the inflorescence in Trichospira are not truly opposite but become subopposite by alternating short internodes.

Corollas: The shape of the corolla with its deeply cut narrow lobes is characteristic of the Vernonieae. The lobes reach an extreme form rarely approached and not equalled in the Heliantheae.

Anthers: In structure the anthers show the greatest concentration of critical characters. The bases, in their reduced form show some variation, but are generally much extended and untailed as in other Vernonieae. The exothecial cells are subquadrate as is common in both tribes but the thickenings are weak and curved and distributed toward both transverse and longitudinal walls as in the Vernonieae. The anther appendage is flat and shows none of the concave structure seen in all Heliantheae.

Pollen: The Vernonieae have shown a consistent form of pollen bearing connecting ridges while the pollen in the Heliantheae bears separated spines. The pollen of Trichospira is difficult to see because of thin walls that collapse easily, but initial impressions have been confirmed by use of the Scanning Electron Microscope. The pollen has the spines connected by ridges.

Styles: The style is totally characteristic of the Vernonieae with the slender tapering branches bearing stigmatic surfaces on the inner side. The hairs are prominent on the backs of the branches and are continued below the bases of the branches similarly to other Vernonieae but unlike any Heliantheae with which the genus has ever been compared.

The only feature on which relationship with the Heliantheae might be based is the structure of the achene. This last is flattened and strongly biaristate or bicornute depending on interpretation. Superficial resemblance to various members of the Coreopsinae is marked but it might be noted that the retrorse setae found in many Coreopsinae are not found in Trichospira. The wall structure of the achene seems rather unique in both the Heliantheae and the Vernonieae having small firm-walled cells lacking raphides and bearing small spines. Such achene walls are not seen in any Coreopsinae but have not been seen in other Vernonieae either. The illustration of Oiospermum involucreatum Lessing in the Flora Brasiliensis treatment of the Vernonieae (Baker 1873) suggests a similar wall structure to that of Trichospira but no specimens of Oiospermum have been seen.

Further indication that Trichospira is not a member of the Coreopsinae can be obtained by a closer analysis of the latter group. As recognized by Hoffman the Coreopsinae do seem to contain a very natural main element with a few very unrelated genera appended. The true Coreopsinae can be defined by (1) the lack of the common form of sharp tipped Helianthian hairs

on the corolla or achene (2) the lack of any glands or hairs on the anther appendage or connective and (3) by the usual presence of a prominent laticifer extending upward in the anther reaching into the appendage. The latter character is unfortunately not found in absolutely all Coreopsinae but is often very noticeable when containing dark yellowish or reddish latex. By this delimitation Guizotia having "Helianthian hairs" on the corollas and glands on the anther appendages, and the related pair Synedrella and Calyptocarpus having a few helianthian hairs on the corolla or achene would be transferred from the Coreopsinae to the Verbesinae in the Heliantheae.

The study indicates that flattened bicornute achenes have developed independently in at least three groups of the composites, one of these being the Vernoniaceae.

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